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ENGLISH NATURE

Breydon Water

European marine site

English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

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Preface

This document provides English Nature's advice to other relevant authorities as to (a) the conservation objectives and (b) any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for the Breydon Water European marine site. This advice is being prepared to fulfill our obligations under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994.

The Breydon Water Special Protection Area is a European marine site. European marine sites are defined in the Conservation (Natural Habitats &c.) Regulations 1994 as any part of a European site covered (continuously or intermittently) by tidal waters or any part of the sea in or adjacent to Great Britain up to the seaward limit of territorial waters. European sites include Special Areas of Conservation (designated under the Habitats Directive, which support certain natural habitats and species of European importance), and Special Protection Areas (designated under the Birds Directive which support significant numbers of internationally important wild birds). In many instances these designations may coincide and our advice is being prepared to cover both the SAC and SPA interests where this occurs.

This 'Regulation 33 package' is designed to help relevant and competent authorities, who have responsibilities to implement the Habitats Directive, to:

- understand the international nature conservation importance of the site, underlying physical processes and the ecological requirements of the habitats and species involved;
- advise relevant authorities as to the conservation objectives for the site and operations which may cause deterioration or disturbance
- set the standards against which the condition of the site's interest features can be determined and undertake compliance monitoring to establish whether they are in favourable condition; and
- develop, if deemed necessary, a management scheme to ensure that the features of the site are maintained.

In addition, the Regulation 33 package will provide a basis to inform on the scope and nature of 'appropriate assessment' required in relation to plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20). English Nature will keep this advice under review and may update it every six years or sooner, depending on the changing circumstances of the European marine site. In addition, we will provide more detailed advice to competent and relevant authorities to assess the implications of any given plan or project under the Regulations, where appropriate, at the time a plan or project is being considered. If as a result of the UK SPA Network Review (led by JNCC) interest features are added to this European marine site or the site boundaries change, English Nature will amend this advice, as appropriate.

English Nature will also reflect recent changes in policy towards Ramsar sites in our advice where needed and when such advice is next re-issued.

Tim Bines
General Manager
English Nature
24 August 2001

Issued 24 August 2001

English Nature's advice for Breydon Water European marine site given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

Contents

Preface **1**

List of Figures and Tables **4**

1. Introduction **6**
1.1 Natura 2000 6
1.2 English Nature's role 7
1.3 The role of relevant authorities 7
1.4 Activity outside the control of relevant authorities 8
1.5 Responsibilities under other conservation designations 8
1.6 Role of conservation objectives 8
1.7 Role of advice on operations 8

2. Qualifying species within the SPA under the EU Birds Directive **10**

3. Interest features of the European marine site **11**
3.1 Background and context 11
3.2 Reductions in organic inputs 12
3.3 General description 12
3.4 Internationally important populations of the regularly occurring Annex I species 13
3.4.1 Key sub-features 14
3.5 Internationally important populations of regularly occurring migratory bird species 14
3.5.1 Key sub-features 15
3.6 Internationally important assemblage of waterfowl 15
3.6.1 Key sub-features 16

4. Conservation objectives for SPA interest features **17**
4.1 The conservation objective for the internationally important populations of the regularly occurring Annex I bird species 17
4.2 The conservation objective for the internationally important populations of regularly occurring migratory bird species 17
4.3 The conservation objective for the internationally important assemblage of waterfowl 18

5. Favourable condition table **21**

6. Advice on operations **27**
6.1 Purpose of advice 27
6.2 Methods for assessment 27
6.2.1 Sensitivity assessment 27
6.2.2 Exposure assessment 28
6.2.3 Vulnerability 28
6.3 Format of advice 28
6.4 Update and review of advice 29
6.5 Summary of advice on operations 29
6.5.1 Internationally important populations of regularly occurring Annex I species 29
6.5.2 Internationally important populations of regularly occurring migratory species 29
6.5.3 Internationally important waterfowl assemblage 30

6.6 Plans and Projects 30
6.7 Review of consents..... 30
6.8 Interest feature and sub-feature specific advice on operations 33
6.8.1 Internationally important populations of regularly occurring Annex I species and Internationally important populations of regularly occurring migratory species and waterfowl assemblage..... 33

7. Bibliography 49

8. Glossary 51

Appendix I **Matrix of relative vulnerability**

Appendix II **English Nature's 'Habitats regulations guidance note 1: The Appropriate Assessment (Regulation 48)'**

Appendix III **List of relevant authorities**

List of Figures and Tables

Figure 1 **Location map of Breydon Water SPA**

Figure 2 **Map showing the boundary of Breydon Water European marine site**

Figure 3 **Map showing sub-features of Breydon Water European marine site**

Table 1 **Information on populations of bird species qualifying under the Birds Directive using the Breydon Water European marine site at the time the SPA was classified**

Table 2 **Favourable condition table for Breydon Water European marine site**

Table 3 **Summary of operations which may cause deterioration or disturbance to the Breydon Water European marine site interest features at current levels of use**

Table 4 **Assessment of relative exposure of interest features and sub-features of Breydon Water European marine site to different categories of operations based on current level of activities (May 2001)**

Table 5 **Assessment of the relative vulnerability of interest features and sub-features of Breydon Water European marine site to different categories of operations.**

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English Nature's advice for Breydon Water European marine site given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994

1. Introduction

1.1 Natura 2000

The European Union Habitats[1] and Birds[2] Directives are international obligations which set out a number of actions to be taken for nature conservation. The Habitats Directive aims to promote the maintenance of biodiversity, taking account of economic, social, cultural and regional requirements, and sets out measures to maintain or restore, natural habitats and species of European Union interest at favourable conservation status[3]. The Birds Directive protects all wild birds and their habitats within the European Union, and there are special measures for migratory birds and those that are considered rare or vulnerable.

The Habitats and Birds Directives include requirements for the designation of conservation areas. In the case of the Habitats Directive these are Special Areas of Conservation (SACs) which support certain natural habitats or species, and in the Birds Directive, Special Protection Areas (SPAs) which support wild birds of European Union interest. These sites will form a network of conservation areas across the EU to be known as "Natura 2000". Where SACs or SPAs consist of areas continuously or intermittently covered by tidal waters or any part of the sea in or adjacent to Great Britain up to the limit of territorial waters, they are referred to as European marine sites.

Further guidance on European marine sites is contained in the Department of the Environment Transport and Regions/Welsh Office document: *European marine sites in England & Wales: A guide to the Conservation (Natural Habitats &c.) Regulations 1994 and to the preparation and application of management schemes* The following paragraphs taken from this document are of particular relevance to this package:

> *"Sustainable development is one of the fundamental principles of the Habitats Directive. As stated in the preamble, the Directive makes a contribution to the general objective of sustainable development. The maintenance of biodiversity may, in certain cases, require the maintenance, or indeed the encouragement, of human activities. In other words the aim is not to exclude human activities from European sites, but rather to ensure that they are undertaken in ways which do not threaten the nature conservation interest, and wherever possible, in ways which support it.*
>
> *Much of our wildlife and important habitats can be sustained alongside human activities. It is assumed that, where they are not causing deterioration or significant disturbance, activities and*

1 Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

2 Council Directive 79/409/EEC on the conservation of wild birds

3 A habitat or species is defined as being at favourable conservation status when its natural range and the areas it covers within that range are stable or increasing and the specific structure and functions which are necessary for its long term maintenance exist and are likely to continue to exist for the foreseeable future.

management practices which have coexisted with nature conservation interests will continue when areas become European marine sites. Where this is not the case the Directive requires appropriate action to be taken to ensure that any continuation is compatible with the nature conservation objectives of the site.

The principle objective of conserving the nature conservation interest of European sites will not be realised without the co-operation and commitment of those who own, live, work or take pleasure in and around the areas. To enable the activities of local individuals and enterprises and of statutory users of marine areas to be sustained, together with the conservation of habitats and species, it is essential to promote understanding between all relevant bodies."

1.2 English Nature's role

The Conservation (Natural Habitats &c.) Regulations 1994 translate the Habitats Directive into law in Great Britain. It gives English Nature a statutory responsibility to advise relevant authorities as to the conservation objectives for European marine sites in England and to advise relevant authorities as to any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the sites have been designated. This information will be a key component of any of the management schemes which may be developed for these sites.

This document is English Nature's advice for the Breydon Water European marine site issued in fulfilment of Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (the 'Regulation 33 package'). Copies of key references quoted in this document are held at the English Nature Norfolk Team local office.

In addition to providing such advice, the Regulation 33 package informs on the scope and nature of 'appropriate assessment' which the Directive requires to be undertaken for plans and projects (Regulations 48 & 50 and by English Nature under Regulation 20.) English Nature may also provide more detailed advice to competent and relevant authorities to assess the implications of any such plans or projects.

1.3 The role of relevant authorities

The Conservation (Natural Habitats &c.) Regulations 1994 require all competent authorities (i.e. any Minister, government department, public or statutory undertaker, public body or person holding a public office that exercises legislative powers), to exercise their functions so as to secure compliance with the Habitats Directive. This European marine site includes the channel of the River Yare which is a subtidal component. The intertidal areas of the European marine site are managed through existing SSSI mechanisms under the Wildlife and Countryside Act 1981, as amended 1985. However, relevant authorities (i.e. competent authorities that have local powers or functions which have, or could have, an impact on the marine area within or adjacent to a European marine site) may, if deemed necessary, draw up a management scheme under Regulation 34 for the European marine site component of the Breydon Water SPA. If such a management scheme is developed, it will provide the framework through which relevant authorities exercise their functions so as to secure compliance with the Habitats Directive and must be based on the advice in this package. Irrespective of this decision, relevant authorities must, within their areas of jurisdiction, have regard to both direct and indirect effects on an interest feature of the site as well as cumulative effects. This may include consideration of features and issues outside the boundary of the European marine site and above the highest astronomical tide.

Relevant authorities should ensure that all plans for the area integrate with any management scheme for the

European marine site. Such plans may include shoreline management plans, CHaMPs (Coastal Habitat Management Plans), local Environment Agency plans, SSSI management plans, local BAP plans and sustainable development strategies for estuaries. This must occur to ensure that there is only a single management scheme through which all relevant authorities exercise their duties under the Conservation (Natural Habitats &c.) Regulations 1994.

Relevant authorities also need to have regard to changing circumstances of the SPA and may therefore need to modify the way in which they exercise their functions so as to maintain the favourable condition of interest features concerned in the long term. There is no requirement for relevant authorities to take any actions outside their statutory functions.

Under certain circumstances, where another relevant authority is unable to act for legal reasons, or where there is no other relevant authority, English Nature is empowered to use its bylaw-making powers for Marine Nature Reserves (MNR) for use in European marine sites.

1.4 Activity outside the control of relevant authorities

Nothing within this Regulation 33 package will require relevant authorities to undertake any actions or ameliorate changes in the condition of interest features if it is shown that the changes result wholly from natural causes[4]. This also applies if the changes, although causing deterioration or disturbance to the interest features, are the result of human or natural events outside their control. Having issued Regulation 33 advice for European marine sites, English Nature will work with relevant authorities and others to agree, within a defined time frame, a protocol for evaluating all observed changes to baselines and to develop an understanding of natural change and provide further guidance as appropriate and possible.

1.5 Responsibilities under other conservation designations

In addition to its SPA status, parts of Breydon Water are also designated and subject to agreements under other conservation legislation (eg. SSSIs notified under the Wildlife and Countryside Act 1981 as amended 1985). The obligations of relevant authorities and other organisations under such designations are not affected by the advice contained in this document.

1.6 Role of conservation objectives

Section 4 of this document sets out the conservation objectives for the Breydon Water European marine site. They are the starting point from which management schemes and monitoring programmes may be developed as they provide the basis for determining what is currently or may cause a significant effect, and for informing on the scope of appropriate assessments of plans or projects. The conservation objectives set out what needs to be achieved and thus deliver the aims of the Habitats Directive.

1.7 Role of advice on operations

The advice on operations set out in Section 6 provides the basis for discussion about the nature and extent of the operations taking place within or close to the site and which may have an impact on its interest features. It is given on the basis of the working assumption that sites were in favourable condition at the time they were identified. In the 2000-2006 reporting period an assessment of the condition of the site will

[4] Determination of what constitutes natural change will be based on the best available information and scientific opinion at the time.

be made to support this assumption, and ensure that favourable condition is being maintained. The advice should also be used to identify the extent to which existing measures of control, management and use are, or can be made, consistent with the conservation objectives and thereby focus the attention of relevant authorities and surveillance to areas that may need management measures.

This operations advice may need to be supplemented through further discussions with any management and advisory groups for the European marine site.

2. Qualifying species within the SPA under the EU Birds Directive

The boundary of Breydon Water Special Protection Area (SPA) is shown in Figure 1.

Breydon Water SPA qualifies under Article 4.1 of the EU Birds Directive by supporting:

- Internationally important populations of regularly occurring Annex I species.

It also qualifies under Article 4.2 of the EU Birds Directive in that it supports:

- Internationally important populations of regularly occurring migratory species; and
- An internationally important assemblage of waterfowl.

Breydon Water was classified as an SPA on 29 March 1996. Consultations commenced on the proposal to extend the site on 7 February 1997. The extended area of Breydon Water SPA was classified on 2 February 2000. It is the citation of 2 February 2000 on which this Regulation 33 advice is based.

Breydon Water was designated as a Ramsar site on 29 March 1996. Consultations commenced on the proposal to extend the site on 7 February 1997. The extended area of Breydon Water Ramsar site was designated on 2 February 2000.

3. Interest features of the European marine site

Breydon Water SPA includes both marine areas (ie. land covered continuously or intermittently by tidal waters) and land which is not subject to tidal influence. The marine part of the SPA is termed a European marine site. The extent of Breydon Water European marine site is illustrated in Figure 2. The seaward boundary of the European marine site is concurrent with that of the SPA. The landward boundary of the European marine site is the upper boundary of the SPA, or where that extends above land covered continuously or intermittently by tidal waters it is at the limit of the marine habitats.

Where SPA qualifying species occur within the European marine site they are referred to as interest features. Sub-features (habitats) have also been identified to highlight the ecologically important components of the European marine site for each interest feature. The interest features and sub-features for Breydon Water European marine site are described below and the sub-features are mapped at Figure 3 to show their distribution and extent.

3.1 Background and context

A major aim of the Birds Directive is to take special measures to conserve the habitats of qualifying birds in order to ensure their survival and reproduction within the European Union. A key mechanism in achieving this is the classification by Member States of the most suitable sites as SPAs.

English Nature's conservation objectives at a site level focus on maintaining the condition of the habitats used by the qualifying species. Habitat condition will be delivered through appropriate site management including the avoidance of damaging disturbance. In reporting on Favourable Conservation Status, account will need to be taken both of habitat condition and the status of the birds on the SPA.

Accordingly, English Nature will use annual counts, in the context of five year peak means for qualifying species, together with available information on population and distribution trends, to assess whether an SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of the species. Count information will be assessed in combination with information on habitat condition, at the appropriate time within the reporting cycle, in order to report to the European Commission.

English Nature's advice focuses on the qualifying species for which the SPA was originally classified despite the fact that numbers and species composition may have changed on this site since that time. Such population and species composition changes are being documented through the UK SPA Network Review, led by JNCC, which will provide advice to Ministers on any changes required in SPA citations. Depending on the review and decisions from DEFRA, English Nature may reissue this advice.

In addition to focusing on avoiding deterioration to the habitats of the qualifying species, the Habitats Directive also requires that actions are taken to avoid significant disturbance to the species for which the site was designated. Such disturbance may include alterations in population trends and/or distribution patterns. Avoiding disturbance to species requirements is mentioned in the favourable condition table underpinning the conservation objectives for the SPA. In this context, five year peak mean information on populations will be used as the basis for assessing whether disturbance is damaging.

Attention is, however, also directed to the inclusion of disturbance in the advice on operations provided in section 6. Where disturbance is highlighted in such advice, relevant authorities need to avoid damaging disturbance to qualifying species when exercising their functions under the Directive.

3.2 Reductions in organic inputs

Under the Urban Waste Water Treatment (UWWT) Directive all coastal discharges above a certain volume must have secondary treatment installed by the end of 2000. Secondary treatment of sewage will significantly reduce organic loading and to a lesser extent reduce concentrations of dissolved nutrients. The effects of these reductions on coastal features and the birds they support are difficult to predict. On the one hand, it might be expected that there would be a redistribution of feeding birds or a reduction in the overall capacity of a coastal area to support bird populations. On the other hand, where bird populations are currently adversely affected by eutrophication, cleaner discharges may contribute to improving site condition.

English Nature supports the cleaning up of coastal discharges. On balance, the overall ecological benefits of cleaner discharges are likely, in general, to outweigh any subsequent local decline in bird numbers, although there is presently insufficient knowledge to accurately predict the effects in general or for individual SPA sites. Consequently, English Nature, with input from the Countryside Council for Wales and the Environment Agency, is commissioning a related research project to study the relationship between birds and organic nutrient levels, the overall effects on the ecosystem and thereby the effects of the clean-up programme under the UWWT and Bathing Water Directives.

Under the Habitats Regulations, if significant effects are likely from such activities, the competent authority (in this case the Environment Agency) will be required to undertake an appropriate assessment to determine whether there is an adverse effect on site integrity.

3.3 General description

In recognition that bird populations may change as a reflection of national or international trends or events, this advice on the bird interests of the European marine site focuses on the condition of the habitats necessary to support the bird populations. Sub-features are identified which describe the key habitats within the European marine site necessary to support the birds that qualify within the SPA. Detailed information and targets for habitat condition are listed in the favourable condition table in Section 5. Bird usage of the site varies seasonally, with different areas being favoured over others at certain times of the year. However, annual counts for qualifying species will be used by English Nature, in the context of five year peak means, together with available information on UK population and distribution trends, to assess whether this SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of the species across Europe.

Bird communities are highly mobile and exhibit patterns of activity related to tidal water movements and many other factors. Different bird species exploit different parts of a marine area and different prey species. Changes in the habitat may therefore affect them differently. The important bird populations at this site require areas for feeding and roosting. The most important factors related to this are:

- Current extent and distribution of suitable feeding and roosting habitat (e.g. open water, mudflats, saltmarsh);
- Current extent and distribution of suitable breeding habitat (e.g. saltmarsh and artificial nesting platforms)
- Sufficient prey availability (e.g. small fish, molluscs, crustaceans and worms);
- Levels of disturbance consistent with maintaining conditions for birds feeding and roosting;
- Water quality necessary to maintain intertidal plant and animal communities;
- Water quantity and salinity gradients necessary to maintain saltmarsh conditions suitable for bird feeding and roosting; and
- Undisturbed tidal patterns.

3.4 Internationally important populations of the regularly occurring Annex I species

The species listed in Annex I of the Birds Directive are the subject of special conservation measures concerning their habitat in order to ensure their survival and reproduction in their area of distribution. Species listed on Annex I are in danger of extinction, rare or vulnerable. Annex I species that regularly occur at levels over 1% of the Great Britain population meet the SPA qualifying criteria. Breydon Water supports internationally important wintering populations of Bewick's swan *Cygnus columbianus bewickii*, avocet *Recurvirostra avosetta*, golden plover *Pluvialis apricaria* and ruff *Philomachus pugnax* and an internationally important breeding population of common tern *Sterna hirundo* (See table 1).

The Annex I species spend a differing proportion of their time on the European marine site. During the winter months, the avocet spend a high proportion of their time on Breydon Water European marine site feeding on the mudflats and roosting on saltmarshes. (It has been observed that numbers of wintering avocet are supplemented by birds on passage during the spring and autumn). The other wintering populations of Annex I species may spend a much lower proportion of their time on the European marine site. The ruff is predominately a bird of flooded marsh and so spends a lesser proportion of its time feeding and roosting on the estuary. Golden plover roost on the mudflats and may also feed here during periods of harsh weather and Bewick's swan occasionally use the estuary as a roost site. At other times these species feed and roost on the grazing marshes, ditches and flooded borrow pits that lie on the landward side of the sea-wall on parts of the Breydon Water SSSI and on the adjacent Halvergate Marshes SSSI. These two adjoining SSSIs are the constituent sites of the Breydon Water SPA and together include the landward extension of the Breydon Water SPA. These areas used by Bewick's swan, golden plover, ruff and common tern are not covered by the highest astronomical tide and therefore lie outwith the boundary of the Breydon Water European marine site. However, the aquatic vegetation of the ditches and flooded borrow pits, and the vegetation of the flooded grassland provide an important food source for populations of wintering Bewick's swan. They also provide suitable feeding habitat for breeding populations of common terns.

It should also be noted that the grazing marshes are used as breeding habitat by avocet during the summer months, although it is only during winter that Breydon Water SPA is used by internationally important numbers of these birds.

During the summer months, the European marine site is also used as a breeding and feeding site by the Annex I species, the common tern. Although originally breeding on saltmarsh, most breeding terns now make use of the breeding platforms that have been erected in the north-eastern part of the estuary. Common tern feed in the shallow coastal water and river channel on the European marine site, but also on the ditches and flooded borrow pits on the landward side of the seawalls, outwith the boundary.

In addition to using the European marine site and sections of Breydon Water SPA above highest astronomical tide, a number of the Annex I species also make use of additional areas of grazing marsh outwith the boundary of the SPA. They may also utilise improved grassland. Populations of Bewick's swan also feed on arable crops including sugar beet.

Objectives to maintain these aspects of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SPA boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

Of additional interest is a non qualifying population of the Annex I species, smew *Mergellus albellus* that occurs at Breydon Water during harsh winters. Also, marsh harriers *Circus aeruginosus* have occasionally bred within the boundary of the site.

3.4.1 Key sub-features

Intertidal sediment communities - Avocet feed primarily on small crustaceans (shrimps etc), marine worms and molluscs. They use sweeping movements of the bill to obtain prey from shallow water or surface sediments but will also pick up individual prey items from the surface of the mud. Avocet feed in a broad band across the estuary, following the waters edge with the ebbing tide. Although ruff are predominantly birds of grazing marsh, they will also feed in a broad band across the estuary following the ebbing tide, particularly during harsh winters. An internationally important wintering population of golden plover roost on the mudflats where they also feed during periods of harsh weather.

Saltmarsh - Saltmarshes are not extensive in Breydon Water European marine site, but nevertheless provide important high tide roost sites for many of the Annex I species including wintering populations of avocet, golden plover and ruff. The saltmarsh to the north of the river channel at the seaward end of the site is the most important roosting area at Breydon Water. Upper saltmarsh also provides opportunities for common tern to nest.

Shallow coastal waters and river channel - Shallow tidal waters provide key feeding and roosting habitat for many of the Annex I species. In the past, wintering populations of Bewick's swan regularly used the estuary as a night time roost and a day roost if they were disturbed from nearby farmland. However, since the establishment of the Berney Marshes reserve, they have roosted less frequently on Breydon Water itself. The shallow tidal waters and river channel are also used by common tern catching small fish, particularly sand eels and sprats.

Artificial nesting platforms - Nesting platforms were erected in the north-eastern sector of the site and have been very successful in ensuring a high level of recruitment to the population of common terns.

3.5 Internationally important populations of regularly occurring migratory bird species

Migratory species that regularly occur at levels of 1% or more of the total biogeographical population meet the SPA criteria and qualify in their own right. Breydon Water supports internationally important numbers of wintering lapwing *Vanellus vanellus*, and thus qualifies for SPA status (See table 1).

Whilst lapwing roost on the saltmarshes and feed on the mudflats of the European marine site during periods of harsh weather, they spend much of their time feeding and roosting on the adjacent grazing marsh within Breydon Water SPA. They will also utilise grasslands and grazing marshes which are outwith the boundary of the SPA. The grazing marshes that lie on the landward side of the sea-wall on Breydon Water SSSI and Halvergate Marshes SSSI (the constituent sites of Breydon Water SPA) are not covered by the highest astronomical tide and therefore lie outwith the boundary of Breydon Water European marine site. It should be noted that the grazing marshes are also used as breeding habitat by lapwing during the summer months, although it is only the wintering populations which are internationally significant.

Objectives to maintain this aspect of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SPA boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

Other migratory species with non-qualifying populations that regularly occur at Breydon Water include **redshank *Tringa totanus*, gadwall *Anas strepera*, whimbrel *Numenius phaeopus* and curlew *Numenius arquata*.**

3.5.1 Key sub-features

Intertidal sediment communities - Although lapwing feed predominantly on the grazing marshes outside the

boundary of the European marine site, they also feed on mudflats during periods of harsh weather when the grazing marsh is frozen.

Saltmarsh - Saltmarshes provide important high tide roost sites for wintering populations of lapwing. The saltmarsh to the north of the river channel at the seaward end of the site is the most important roosting area on Breydon Water for lapwing.

3.6 Internationally important assemblage of waterfowl

The extensive areas of intertidal mudflats at Breydon Water support dense populations of marine invertebrate species, which in turn provide a food source for large populations of waterbirds (wildfowl and waders). As a result, Breydon Water is a key estuary in the UK for wintering waterfowl. In addition to supporting internationally important populations of Annex I bird species and internationally important populations of regularly occurring migratory bird species, Breydon Water also qualifies for its wintering waterfowl assemblage, regularly supporting over 20,000 birds (Cranswick *et al.*, 1999). The wintering waterfowl assemblage includes the internationally important regularly occurring migratory or Annex I wintering species as well as species present in nationally important numbers; or species whose populations exceed 2000 individuals. The key sub-features for the wintering Annex I and migratory species of international importance have already been described in section 3.4.1. and 3.5.1. respectively.

In winter, Breydon Water supports nationally important numbers of cormorant *Phalacrocorax carbo*, European white-fronted goose *Anser albifrons albifrons*, wigeon *Anas penelope*, shoveler *Anas clypeata* and the northern sub-species of black-tailed godwit *Limosa limosa islandica*.

Whilst there are occasional sightings of the southern race of black-tailed godwit *Limosa limosa limosa* on passage, the increase in the *islandica* population at Breydon Water can be attributed to an increase in breeding success in Iceland. The main roost site for black-tailed godwit is on the saltmarsh at the eastern end of the estuary. However, if disturbed, the birds will make use of secondary roost sites on Halvergate, Haddiscoe Island, Burgh Castle and Cobholm grazing marshes.

European white-fronted geese feed and roost predominantly on those part of Breydon Water SSSI and Halvergate Marshes SSSI that lie outwith the European marine site. They occasionally make use of the estuary during periods of hard weather and as a safe roosting haven. The shoveler is present throughout the year and breeds on the grazing marshes in small numbers during the summer months. Shoveler spend much of their time on the adjacent grazing marsh, but regularly feed on the estuary and use the marine site as a safe roosting area when disturbed from the marshes. Wigeon feed on the grazing marsh at night and roost on Breydon Water during the day. The grazing marshes are also used as a roost site by black-tailed godwit. The complex network of ditches and flooded borrow pits are important feeding habitat for populations of wigeon and shoveler.

It has been suggested that a reduction in the frequency with which European white-fronted geese use the estuary is connected with the loss of Scroby Island, a sand bar just off the coast of Great Yarmouth. The sand bar was used by the white-fronted geese as a roost site at low tide. It has now been gradually eroded by natural processes and is rarely above water. The geese now roost further afield, and fly to feed on the grazing marshes that surround the estuary, only occasionally using the estuary as a roosting site.

The ronds of the River Yare form part of the European marine site and are locally important for populations of redshank (*Tringa totanus*) and snipe (*Gallinago gallinago*).

During severe winter weather Breydon Water assumes even greater national and international importance as waterfowl are attracted by the mild conditions and the abundant food resource.

Objectives to maintain this aspect of bird interest in favourable condition are found within English Nature's conservation objectives for the relevant SSSI within the SPA boundary and will be dealt with through procedures outlined in the Conservation (Natural Habitats &c.) Regulations 1994. Relevant authorities need to have regard to such adjacent European interests, as they might be affected by activities taking place within, or adjacent to the European marine site.

3.6.1 Key sub-features

Intertidal sediment communities - Although the European white-fronted geese spend much of their time feeding on the adjacent Halvergate Marshes SSSI, they also use the estuary as a harsh weather refuge when the surrounding marshes are frozen. At these times they feed on *Enteromorpha* which grows on the intertidal sediments on parts of the estuaries. At one time Breydon Water supported extensive eelgrass beds and this would also have been an important food plant for the geese. However, eelgrass may now be extinct on estuary and its status is in need of further investigation. Wigeon are also largely vegetarian and spend part of their time feeding on exposed mud-surface plants where they form tight packs of grazing birds. Black-tailed godwits spend much of their time on the mudflats and specialize in feeding on lugworms and ragworms.

Saltmarsh - Saltmarshes provide important high tide roost sites for many of the species which make up the internationally important assemblage of waterfowl. The saltmarsh to the north of the river channel at the seaward end of the site is the most important roosting area on Breydon Water. Black-tailed godwit form tightly packed roosts at traditional sites, both within and outwith the boundary of the Breydon Water SPA; they usually remain in a distinct and separate flock, even when roosting with other waders. Wigeon also spend part of their time feeding on saltmarsh.

Shallow coastal waters and the river channel - Shallow coastal waters are important for cormorant which contribute to the internationally important assemblage of waterfowl. Cormorant spend the day feeding on Breydon Water and require water with a depth of 2-10 metres in order to feed successfully. At night they leave Breydon Water European marine site and fly to other sites in the Broads to roost. Over the last ten years cormorant have gradually switched from roosting at Ranworth Broad and now largely roost on Fritton Lake. Although Breydon Water was regularly used as a roost site by flocks of white-fronted geese in the recent past, they now tend to feed and roost largely on the Berney Marshes reserve. Wigeon spend much of their time roosting in the open water of Breydon Water during the day. Although populations of the shoveler spend much of their time feeding on the adjacent Halvergate Marshes SSSI, this species uses the estuary as a hard weather refuge when the surrounding marshes are frozen.

4. Conservation objectives for SPA interest features

Under Regulation 33(2)(a) of the Conservation (Natural Habitats &c.) Regulations 1994, English Nature has a duty to advise other relevant authorities as to the conservation objectives for the European site. The conservation objectives for the Breydon Water European marine site interest features are provided below and should be read in the context of other advice given in this package, particularly:

- the attached maps showing the extent of the sub-features;
- summary information on the interest of each of the features; and
- the favourable condition table, providing information on how to recognise favourable condition for the feature and which will act as a basis for the development of a monitoring programme.

4.1 The conservation objective for the internationally important populations of the regularly occurring Annex I bird species

Subject to natural change, maintain in favourable condition[5] the habitats for the **internationally important populations of the regularly occurring Annex I bird species**, under the Birds Directive, in particular:

- **Intertidal sediment communities**
- **Saltmarsh**
- **Shallow coastal waters and river channel**
- **Artificial nesting platforms**

Numbers of bird species using these habitats are given in Table 1

4.2 The conservation objective for the internationally important populations of regularly occurring migratory bird species

Subject to natural change, maintain in favourable condition[5] the habitats for the internationally important populations of regularly occurring migratory bird species, under the Birds Directive, in particular:

- **Intertidal sediment communities**
- **Saltmarsh**

Numbers of bird species using these habitats are given in Table 1

4.3 The conservation objective for the internationally important assemblage of waterfowl

Subject to natural change, maintain in favourable condition [5] the habitats for the internationally important assemblage of waterfowl under the Birds Directive, in particular:
• **Intertidal sediment communities** • **Saltmarsh** • **Shallow coastal waters and river channel**
Numbers of bird species using these habitats are given in Table 1

Note: These SPA conservation objectives focus on habitat condition in recognition that bird populations may change as a reflection of national or international trends or events. Annual counts for qualifying species will be used by English Nature, in the context of five year peak means, together with available information on UK population and distribution trends, to assess whether this SPA is continuing to make an appropriate contribution to the Favourable Conservation Status of the species across Europe.

[5] For a detailed definition of how to recognise favourable condition see attached table 2 (Section 5)

Table 1 Information on populations of bird species qualifying under the Birds Directive using the Breydon Water European marine site at the time the SPA was classified.

Internationally important populations of regularly occurring Annex I species.

Species	Population (5 yr peak mean)*		
Bewick's swan (*Cygnus columbianus bewickii*)	391 birds (wintering)	5.6% Great Britain	1991/92 - 1995/96
Avocet (*Recurvirostra avosetta*)	33 birds (wintering)	3.3% Great Britain	1991/92 - 1995/96
Golden plover (*Pluvialis apricaria*)	5,040 birds (wintering)	2.0% Great Britain	1991/92 - 1995/96
Ruff (*Philomachus pugnax*)	54 birds (passage)	7.7% Great Britain	1991/92 - 1995/96
Common tern (*Sterna hirundo*)	155 pairs (breeding) five year mean	1.3% Great Britain	1991/92 - 1995/96

Internationally important populations of regularly occurring migratory bird species.[6]

Species	Population (5 year peak mean)*		
Lapwing (*Vanellus vanellus*)	24,940 birds (wintering)	1.2 % Biogeographic	1991/92 - 1995/96

An internationally important assemblage of waterfowl.

Importance	Population (5 year peak mean)*	
Breydon supports large populations of wintering waterfowl.	43,225 individual birds	1991/92 - 1995/96

* SPA citation (February 2000) held on Register of European marine sites for Great Britain.

6 Breydon Water is regularly used by 1% or more of the biogeographical population of a regularly occurring species (other than those listed on Annex I) in any season (Cranswick *et al.*, 1995).

Nationally important bird populations within the internationally important waterfowl assemblage.

Species	Importance
Cormorant *Phalacrocorax carbo*	Nationally important population
European white-fronted goose *Anser albifrons albifrons*	Nationally important population
Wigeon *Anas penelope*	Nationally important population
Shoveler *Anas clypeata*	Nationally important population
Black-tailed godwit *Limosa limosa islandica*	Nationally important population

5. Favourable condition table

The favourable condition table is supplied as an integral part of English Nature's Regulation 33 advice package. It is intended to supplement the conservation objectives only in relation to management of activities and requirements on monitoring the condition of the site and its features. The table **does not by itself** provide a comprehensive basis on which to assess plans and projects as required under Regulations 20 and 48-50, but it does provide a basis to inform the scope and nature of any 'appropriate assessment' that may be needed. It should be noted that appropriate assessments are, by contrast, a separate activity to condition monitoring requiring consideration of issues specific to individual plans or projects. English Nature will provide more detailed advice to competent and relevant authorities to assess the implications of any given plan or project under the Regulations, where appropriate, at the time a plan or project is being considered.

The favourable condition table is the principle source of information that English Nature will use to assess the condition of an interest feature and as such comprises indicators of condition. On many terrestrial European sites, we know sufficient about the preferred or target condition of qualifying habitats to be able to define measures and associated targets for all attributes to be assessed in condition monitoring. Assessments as to whether individual interest features are in favourable condition will be made against these targets. In European marine sites we know less about habitat condition and find it difficult to specify favourable condition. Individual sites within a single marine habitat category are also all very different, further hampering the identification of generic indicators of condition. Accordingly, in the absence of such information, condition of interest features in European marine sites will be assessed against targets based on the existing conditions, which may need to be established through baseline surveys in many cases.

The assumption that existing interest features on European marine sites are in favourable condition will be tested in the 2000 - 2006 reporting period and the results subsequently fed back into our advice and site management. Where there is more than one year's observations on the condition of marine habitats, all available information will need to be used to set the site within long-term trends in order to form a view on favourable condition. Where it may become clear that certain attributes are a cause for concern, and if detailed studies prove this correct, restorative management actions will need to be taken to return the interest feature from unfavourable to favourable condition. It is the intention of English Nature to provide quantification of targets in the favourable condition table during the 2000 - 2006 reporting period.

This advice also provides the basis for discussions with management and advisory groups, and as such the attributes and associated measures and targets may be modified over time. The aim is to produce a single agreed set of attributes that will then be monitored in order to report on the condition of features. Monitoring of the attributes may be of fairly coarse methodology, underpinned by more rigorous methods on specific areas within the site. To meet UK agreed common standards, English Nature will be committed to reporting on each of the attributes subsequently listed in the final version of the table, although the information to be used may be collected by other organisations through agreements.

The table will be an important, but not the only, driver of the site monitoring programme. Other data, such as results from compliance monitoring and appropriate assessments, will also have an important role in assessing condition. The monitoring programme will be developed as part of the management scheme process through discussion with the relevant authorities and other interested parties. English Nature will be responsible for collating the information required to assess condition and will form a judgement on the condition of each feature within the site, taking into account all available information and using the favourable condition table as a guide.

Box 1	**Glossary of terms used in the favourable condition table**
Interest feature	The habitat or species for which the site has been selected.
Sub-feature	An ecologically important sub-division of the interest feature.
Attribute	Selected characteristic of an interest feature/sub-feature which provides an indication of the condition of the feature to which it applies.
Measure	What will be measured in terms of the units of measurement, arithmetic nature and frequency at which the measurement is taken. This measure will be attained using a range of methods from broad scale to more specific across the site.
Target	This defines the desired condition of an attribute, taking into account fluctuations due to natural change. Changes that are significantly different from the target will serve as a trigger mechanism through which some further investigation or remedial action is taken.
Comments	The rationale for selection of the attribute.

Table 2 Favourable Condition Table for Breydon Water European marine site
Numbers of bird species using these habitats are given in Table 1

NB - Many of the attributes will be able to be monitored at the same time or during the same survey. The frequency of sampling for many attributes may need to be greater during the first reporting cycle in order to characterise the site and establish the baseline.

Interest Feature	Sub- Feature	Attribute	Measure	Target	Comments
Annex I species of European importance, including those which form part of the waterfowl assemblage	All sub-features	Extent of habitat.	Area (ha), measured once per reporting cycle.	No significant decrease from an established baseline[7], subject to natural change.	For all habitats for all qualifying Annex I species. Intertidal sediment communities and shallow coastal waters provide important feeding and roosting habitat. Saltmarsh and artificial nesting platforms provide important nesting and roosting habitat.
		Disturbance in nesting, roosting and feeding areas.	Reduction or displacement of birds and productivity of terns, measured periodically (frequency to be determined).	No significant displacement or reduction in productivity of terns attributable to human disturbance from an established baseline[7],	Excessive disturbance can result in reduced food intake and/or increased energy expenditure. Periods of extremely high tides when the mudflats are covered during the whole of the tidal cycle and extreme cold weather will need to be recorded as this will affect numbers of wildfowl and waders. Use WeBS (Wetland Bird Survey) high- tide and low-tide counts as baseline. The breeding success of terns is particularly vulnerable to disturbance and predation. Productivity (number of successfully fledged young) can be used to monitor disturbance.
Annex I species of European importance, including those which form part of the waterfowl	All sub-features	Absence of obstructions to viewlines	Open terrain relatively free of obstructions (feeding, anti-predator, roosting), measured periodically (frequency to be determined).	No significant reduction in view-lines in feeding and roosting areas from an established baseline[7], subject to natural change.	Bewick swans prefer unrestricted views over 500 metres. Golden plover and ruff prefer unrestricted views over 200 metres.

Interest Feature	Sub- Feature	Attribute	Measure	Target	Comments
assemblage	Intertidal sediment communities and saltmarsh	Food availability	Abundance of intertidal invertebrates, measured periodically (frequency to be determined).	No significant reduction in presence and abundance of prey species from an established baseline[7], subject to natural change.	Small marine invertebrates are important for ruff and for avocet including *Arenicola* and *Hediste*.
	Saltmarsh and artificial nesting platforms	Vegetation Characteristics	Mix of short vegetation/bare ground (colonial nesting terns & roosting waders) and longer vegetation (concealment for terns), measured periodically (frequency to be determined).	Extent of vegetation heights and bare ground throughout areas used for nesting and roosting should not deviate significantly from an established baseline[7], subject to natural change.	Short vegetation of <3cm, in patches amongst bare ground/shingle for nesting common terns amongst saltmarsh. Vegetation of <10cm is required throughout areas used by roosting waders.
Annex I species of European importance	Shallow coastal waters and river channel	Food availability	Abundance of fish, measured periodically (frequency to be determined).	No significant reduction in presence and abundance of prey species from an established baseline[7], subject to natural change.	Fish, particularly sand eel and sprat of 5cm are important food for common tern.
Migratory species of European and national importance within the waterfowl assemblage	All sub-features	Extent of habitat.	Area (ha), measured once per reporting cycle.	No significant decrease from an established baseline[7], subject to natural change.	For all habitats for all qualifying migratory species. Intertidal sediment communities, saltmarsh and shallow coastal waters provide important feeding and roosting habitat.

Interest Feature	Sub- Feature	Attribute	Measure	Target	Comments
Migratory species of European and national importance within the waterfowl assemblage	All sub-features	Disturbance in roosting and feeding areas	Reduction or displacement of birds, measured periodically (frequency to be determined).	No significant displacement of birds attributable to human disturbance from an established baseline[7], subject to natural change.	Excessive disturbance can result in reduced food intake and/or increased energy expenditure. Periods of extremely high tides, when the mudflats are covered during the whole of the tidal cycle, and extreme cold weather will need to be recorded as this will affect numbers. Use WeBS (Wetland Bird Survey) high- tide and low-tide counts as baseline.
		Absence of obstructions to viewlines	Open terrain relatively free of obstructions (feeding, anti-predator, roosting), measured periodically (frequency to be determined).	No significant reduction in view-lines in feeding and roosting areas, from an established baseline[7], subject to natural change.	White fronted goose, lapwing and wigeon prefer unrestricted views over 500 metres. Black-tailed godwit prefer unrestricted views over 200 metres.
	Intertidal sediment communities and saltmarsh	Food availability	Abundance of surface and sub-surface invertebrates, measured periodically (frequency to be determined).	No significant reduction in presence and abundance of prey species from an established baseline[7], subject to natural change.	Marine invertebrates including molluscs, marine worms & crustaceans are important food for black-tailed godwit including *Macoma, Cardium and Hediste*. *Hydroid* are important for shoveler.
	Intertidal sediment communities	Food availability	Abundance of eel grass and extent and cover of green macroalgal mats, measured periodically in terms of area, extent and depth (frequency to be determined).	No significant increase or reduction in presence and abundance of eel grass and/or extent and cover of green macroalgal mats from an established baseline[7], subject to natural change.	Eel grass and green macroalgal mats are important for wigeon. However, an increase in the extent and/or cover of the mats would be at the expense of bare mudflats. This might limit the availability of the invertebrate communities that sustain many of the populations of waders that frequent Breydon Water
Migratory species of European and national importance within the	Saltmarsh	Vegetation characteristics	Open, short vegetation or bare ground predominating (feeding & roosting). Measured periodically (frequency to be determined)	Vegetation height and extent of bare ground throughout areas used for feeding and roosting should not deviate significantly from an established baseline[7], subject to natural change.	Vegetation of <10cm is required throughout areas used by roosting waders. Vegetation of <3cm is required throughout areas used by feeding wigeon.

Interest Feature	Sub- Feature	Attribute	Measure	Target	Comments
waterfowl assemblage		Food availability	Abundance of soft leaved grasses and herbs, measured periodically (frequency to be determined).	No significant reduction in presence and abundance of soft leaved grasses and herbs from an established baseline[7], subject to natural change.	*Agrostis stolonifera*, *Puccinellia maritima* and *Salicornia* spp. are important for wigeon. *Puccinellia maritima*, *Hordeum marinum*, *Lolium perenne*, *Festuca rubra*, and *Alopecurus bulbosus* are important for white-fronted goose.
Internationally important assemblage of waterfowl	Shallow coastal waters	Food availability	Abundance of fish, measured periodically (frequency to be determined).	No significant reduction in presence and abundance of prey species from an established baseline[7], subject to natural change.	Cormorant feed on fish of 10-25cm.

NB. It should be highlighted that extreme events (such as storms reducing or increasing salinities, exceptionally cold winters or warm summers) also need to be recorded as they may be critical in influencing ecological issues in Breydon Water and may well be missed by routine monitoring.

[7]Baselines to be determined during the first reporting cycle.

6. Advice on operations

English Nature has a duty under Regulation 33(2)(b) of the Conservation (Natural Habitats &c.) Regulations 1994 to advise other relevant authorities as to any operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated. Information on how English Nature has developed this advice is given in section 6.2, and on how it may be reviewed and updated in the future, in Section 6.4.

The advice is provided in summary form in Table 3 and Section 6.5 and with more detail in Table 5 and Section 6.8, including advice in relation to specific interest features and their sub-features.

6.1 Purpose of advice

The aim of this advice is to enable all relevant authorities to direct and prioritise their work on the management of activities that pose the greatest potential threat to the favourable condition of interest features on the Breydon Water European marine site. The advice is linked to the conservation objectives for interest features and will help provide the basis for detailed discussions within the management group to formulate and agree a management scheme to agreed timescales for the site. The advice given here will inform on, but is without prejudice to, any advice given under Regulation 48 or Regulation 50 on operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

6.2 Methods for assessment

To develop this advice on operations English Nature has used a three step process involving:

- an assessment of the **sensitivity** of the interest features or their component sub-features to operations;

- an assessment of the **exposure** of each interest feature or their component sub-features to operations; and

- a final assessment of **current vulnerability** of interest features or their component sub-features to operations.

This three step process builds up a level of information necessary to manage activities in and around the European marine site in an effective manner. Through a consistent approach, this process enables English Nature to both explain the reasoning behind our advice and identify to competent and relevant authorities those operations which pose the most current threats to the favourable condition of the interest features on the European marine site.

All the scores of relative sensitivity, exposure and vulnerability are derived using best available scientific information and informed scientific interpretation and judgement. The process uses sufficiently coarse categorisation to minimise uncertainty in information, reflecting the current state of our knowledge and understanding of the marine environment. Information has been gathered from a range of sources including reports such as ABP Research (1999).

6.2.1 Sensitivity assessment

The sensitivity assessment used is an assessment of the relative sensitivity of the interest features or the component sub-features of the Breydon Water European marine site to the effects of broad categories of human activities. In relation to this assessment, sensitivity has been defined as the intolerance of a habitat, community or individual (or individual colony) of a species to damage, or death, from an external factor (Hiscock, 1996). The sensitivity has been assessed in relation to the use of habitats by birds. As an example, wintering birds are highly sensitive to loss of their roosting or feeding grounds.

The sensitivity assessments of the interest features or their component sub-features of the Breydon Water European marine site are based upon a series of scientific review documents. These include reports produced for the UK Marine SAC LIFE project (Davison & Hughes 1998; Elliott *et al* 1998), the Countryside Council for Wales Science Report (Holt *et al*, 1995) and the Marine Habitats Reviews (Jones *et al*, 2000.).

The sensitivity assessments are based on current information but may develop with improvements in scientific knowledge and understanding. In particular, English Nature and Scottish Natural Heritage have commissioned the Marine Biological Association of the UK, through its Marine *Life* Information Network (MarLIN) to provide detailed sensitivity information to underpin this advice, over the next three years, and available to all over the World Wide Web (www.marlin.ac.uk).

6.2.2 Exposure assessment

This has been undertaken for the Breydon Water European marine site by assessing the relative exposure of the interest features or their component sub-features to the effects of broad categories of human activities currently occurring on the site. The exposure has been assessed in relation to the use of habitats by birds. As an example, the feeding and roosting grounds of wintering waders on a given European marine site may be considered highly exposed to toxic contamination from synthetic compounds as a result of discharging toxic substances onto that site.

Discussions with relevant authorities and interested parties was initiated at the Breydon Water Advisory Group meeting on 20 November 2000. This paved the way for further discussions with relevant authorities and stakeholders and additional comments were incorporated into the Reg 33 advice. The six week consultation, which started on 19 January, was extended to the 1 May so as to allow navigational organisations to consult fully with their members before making a full response. The final amendment to the exposure scores was made in May as a result of a representation by the Broads Authority. Hence the legend to the various tables indicates that this advice has been developed using best available scientific information and informed scientific interpretation and judgement (as at May 2001). It should be noted that the advice drawn together as a result of these discussions may be subject to further refinement in the future.

6.2.3 Vulnerability

The third step in the process is to determine the vulnerability of interest features or their component sub-features to operations. This is an integration of sensitivity and exposure. Only if a feature is both sensitive and exposed to a human activity will it be considered vulnerable. In this context therefore, 'vulnerability' has been defined as the exposure of a habitat, community or individual (or individual colony) of a species to an external factor to which it is sensitive (Hiscock, 1996). The process of deriving and scoring relative vulnerability is provided in Appendix I.

6.3 Format of advice

The advice is provided within six broad categories of operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species. This approach therefore:

- enables links to be made between human activities and the ecological requirements of the habitats or species, as required under Article 6 of the Habitats Directive;

- provides a consistent framework to enable relevant authorities in England to assess the effects of activities and identify priorities for management within their areas of responsibility; and

- is appropriately robust to take into account the development of novel activities or operations which may cause deterioration or disturbance to the interest features of the site and should have sufficient stability

to need only infrequent review and updating by English Nature.

Sensitivity and vulnerability have been assessed in relation to the use of habitats by birds.

These broad categories provide a clear framework against which relevant authorities can assess activities under their responsibility. The more detailed information in Table 5 provides relevant authorities with a context against which to consider an assessment of 'significant effect' or any plans or projects which may affect the site and a basis to inform on the scope and nature of appropriate assessments required in relation to plans and projects. It is important to note that this advice is only a starting point for assessing impacts. It does not remove the need for the relevant authorities to consult English Nature formally over individual plans and projects where required to do so under the Regulations.

6.4 Update and review of advice

Information as to the operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated, is provided in light of what English Nature knows about current activities and patterns of usage at the Breydon Water European marine site. English Nature expects that the information on current activities and patterns of usage (which was used to derive table 4) will be supplemented as part of the process of developing the management of the site, and through further discussion with the relevant authorities. The option of zoning this information may be appropriate. As such, it is important that future consideration of this advice by relevant authorities and others takes account of changes in the usage patterns that have occurred at the site, over the intervening period, since the advice was issued. In contrast, the information provided in this advice on the sensitivity of interest features or sub-features (Table 5) is relatively stable and will only change as a result of an improvement in our scientific knowledge, which will be a relatively long term process. Advice for sites will be kept under review and may be periodically updated through discussion with relevant authorities and others to reflect significant changes in our understanding of sensitivity together with the potential effects of plans and projects on the marine environment.

6.5 Summary of advice on operations

6.5.1 Internationally important populations of regularly occurring Annex I species

In pursuit of the conservation objective for "habitats supporting internationally important populations of regularly occurring Annex I species" (Section 4.1), the relevant and competent authorities for Breydon Water European marine site are advised to manage human activities within their remit, such that they do not result in deterioration or significant disturbance to species, or the habitats of species for which the site has been selected, through any of the following:

- Physical loss through removal
- Noise or visual disturbance
- Toxic contamination through increased synthetic compounds
- Non-toxic contamination through changes in nutrient loading

6.5.2 Internationally important populations of regularly occurring migratory species

In pursuit of the conservation objective for "habitats supporting the internationally important populations of regularly occurring migratory species" (Sections 4.2), the relevant and competent authorities for Breydon Water European marine site are advised to manage human activities within their remit, such that they do not result in deterioration or significant disturbance to species, or the habitats of species for which the site has been selected, through any of the following:

- Physical loss through removal
- Noise or visual disturbance

- Toxic contamination through increased synthetic compounds
- Non-toxic contamination through changes in nutrient loading

6.5.3 Internationally important waterfowl assemblage

In pursuit of the conservation objective for "habitats supporting the internationally important waterfowl assemblage" (Sections 4.3), the relevant and competent authorities for Breydon Water European marine site are advised to manage human activities within their remit, such that they do not result in deterioration or significant disturbance to species, or the habitats of species for which the site has been selected, through any of the following:

- Physical loss through removal
- Physical damage through abrasion
- Noise or visual disturbance
- Toxic contamination through increased synthetic compounds
- Non-toxic contamination through changes in nutrient loading

6.6 Plans and Projects

Under Regulation 48(1), an appropriate assessment must be undertaken in respect of any plan or project which:

a. either alone or in combination with other plans or projects is likely to have a ***significant effect*** on a European Site; and
b. is not directly connected with or necessary to the management of the site for nature conservation.

This legal requirement applies to all European sites. Regulation 48 is also applied, as a matter of Government policy, to potential SPAs and listed Ramsar sites.

English Nature's 'Habitats regulations guidance note 1: The Appropriate Assessment (Regulation 48)', is at Appendix II for further information.

Tables 4 and 5 provide relevant authorities with a guide against which to initiate an assessment of the 'significance' of any plans or projects (and ongoing operations or activities) proposed for the site although this will only be the starting point for assessing impacts and does not remove the need for relevant authorities to formally consult English Nature over individual plans and projects where required under the Regulations.

6.7 Review of consents

Regulation 50 of the Conservation (Natural Habitats, &c.) Regulations 1994 requires a competent authority to undertake a review of any existing consent or permission to which Regulation 48(1) would apply if were being reconsidered as of the date on which the site became a European site. Where a review is required under these provisions it must be carried out as soon as reasonably practicable. This will have implications for discharge and other consents, which will need to be reviewed in light of these objectives and may mean that lower targets for background levels of contaminants etc. will need to be set.

Table 3 Summary of operations which may cause deterioration or disturbance to the Breydon Water European marine site interest features at current levels of use[8]

The advice below is not a list of prohibitions but rather a checklist for operations for discussion with the management group, which may need to be subject to some form of management measure(s) or further measures where actions are already in force. Examples of activities under relevant authority jurisdiction are also provided. Operations marked with a √ indicate those features that are considered to be highly or moderately vulnerable to the effects of the operations.

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex I birds	Internationally important migratory species	Internationally important waterfowl assemblage
Physical loss Removal (e.g. land claim, maintenance dredging of channel) Smothering (e.g. by artificial structures, disposal of dredge spoil)	✓	✓	✓
Physical damage Siltation (e.g. agricultural run-off, dredging) Abrasion (e.g. wash from boats) Selective extraction (e.g. aggregate dredging)			✓
Non-physical disturbance Noise (e.g. aircraft noise) Visual (e.g. recreational activity)	✓ ✓	✓ ✓	✓ ✓
Toxic contamination Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs) Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons) Introduction of radionuclides (e.g. contamination derived from Sellafield)	✓	✓	✓
Non-toxic contamination Changes in nutrient loading (e.g. agricultural run-off) Changes in organic loading (e.g. sewage outfalls) Changes in thermal regime (e.g. power stations) Changes in turbidity (e.g. agricultural run-off)	✓	✓	✓

Standard list of categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex I birds	Internationally important migratory species	Internationally important waterfowl assemblage
Changes in salinity (e.g.. outfalls)			
Biological disturbance Introduction of microbial pathogens (e.g. eelgrass wasting disease) Introduction of non-native species & translocation (e.g. common cordgrass) Selective extraction of species (e.g. commercial & recreational fishing)			

[8]This advice has been developed using best available scientific information and informed scientific interpretation and judgement (as at May 2001). This process has used a coarse grading of relative sensitivity, exposure and vulnerability of each interest feature to different categories of operation based on the current state of our knowledge and understanding of the marine environment. This is shown in the sensitivity and vulnerability matrices at Table 5. The advice is indicative only, and is given to guide relevant authorities and others on particular operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species for which the site has been designated. The advice, therefore, is not a list of prohibitions but rather a check list for operations which may need to be subject to some form of management measure(s) or further measures where actions are already in force.

The precise impact of any category of operation occurring on the site will be dependant upon the nature, scale, location and timing of events. More detailed advice is available from English Nature to assist relevant authorities in assessing actual impacts and cumulative effects. Assessment of this information should be undertaken in the development of the management of the site through wider consultation.

In accordance with Government policy guidance, the advice on operations is feature and site specific, and provided in the light of current activities and patterns of usage at the site as at [May 2001]. As such, it is important that future consideration of this advice by relevant authorities, and others, takes account of changes in usage patterns that have occurred at the site over the intervening period. Advice for sites will be kept under review and may be periodically updated through discussions with relevant authorities, and others, to reflect significant changes in our understanding of sensitivity together with the potential effects of plans or projects on the marine environment. The provision of the statutory advice given here, on operations which may cause deterioration of natural habitats or the habitats of species, or disturbance of species, for which the site has been designated, under Regulation 33(2), is provided without prejudice to specific advice given under Regulation 48(3) or Regulation 50 on individual operations that qualify as plans or projects within the meaning of Article 6 of the Habitats Directive.

6.8 Interest feature and sub-feature specific advice on operations

This section provides information to help relate general advice to each of the specific interest features of the Breydon Water European marine site.

This advice relates to the vulnerability of the interest features and sub-features of the Breydon Water European marine site as summarised in Table 3 and set out in more detail in Table 5. An explanation of the sensitivity of the interest features or sub-features follows with an explanation of their exposure and therefore their vulnerability to damage or disturbance from the listed categories of operations. This enables links between the categories of operation and the ecological requirements of the European marine site's interest features, as set out in Section 3, to be made.

The categories of operations may cause damage or disturbance to the interest features and sub-features of Breydon Water European marine site either alone or in combination.

6.8.1 Internationally important populations of regularly occurring Annex I species and Internationally important populations of regularly occurring migratory species and waterfowl assemblage

I) Physical Loss

- Activities or developments resulting in physical loss of the intertidal sub-features are likely to reduce the availability of feeding and roosting habitat and thus be detrimental to the favourable condition of the SPA interest features including all the qualifying Annex I and migratory species.

- The physical loss of areas of intertidal habitats may be caused directly through changes in land use eg. smothering by artificial structures such as jetties; or indirectly as a consequence of changes to coastal processes, for example, increased wave exposure can exacerbate habitat loss and change the nature of existing sediments. Maintenance work or strengthening of sea walls and coastal defences is necessary at Breydon Water in order to protect the grazing marsh habitats in the lea of the walls. However, this work has the potential to impact upon intertidal sediment and saltmarsh communities by altering sediment movements on the site. In connection with this point, it has been suggested that the recent replacement of seawalls with a rough surface, to seawalls with a smooth surface has led to changes in the ability of the walls to reduce wave energy and slow down currents in their vicinity, thereby affecting the adjacent mudflats. Maintenance or strengthening work to the sea-walls that surround Breydon Water should be carried out with the minimum of disturbance to the saltmarsh or mudflats, and should be undertaken at a time of year that causes the least disturbance to the assemblages of birds that use Breydon Water.

- Physical loss may also occur as a result of seral changes on the site, and the conversion of one habitat into another. It has been noted that the rate of accretion of sediments on the mudflats at the eastern end of Breydon Water has led to the development of saltmarsh communities which have colonised at the expense of mudflat communities. The development of this saltmarsh is a feature of some interest as in most estuaries, the intertidal flats tend to fall, rather than rise in level in a seawards direction. Although these seral changes occur as a result of a natural process, it is not known whether the rate of these changes has been accelerated by an increase in the sediment budget of Breydon Water. In the long term, this could be an issue in that because Breydon Water is an enclosed estuary, there are no shallow coastal waters in which accreting mudflats can develop to compensate for the loss to existing saltmarsh communities. However, changes in sea level rise and the opportunity of setting back flood embankments under the Broads Flood Alleviation Project could mitigate the natural trend. Breydon Water will also be monitored to determine the rate of saltmarsh accretion as part of this project.

- The channel of the River Yare, as it passes through Breydon Water is largely self-cleaning, and surveys by the Great Yarmouth Port Authority suggest that for most of its length the channel is actually

becoming deeper. It has been suggested that the river channel may in part owe its existence to the construction of a tidal groyne known as the 'Dickey Works' (built it is believed in 1832) at the western end of Breydon which forces the ebb tide into the main channel. However, there are several points within the boundary and just outwith the boundary of the European marine site where maintenance dredging is necessary. The number of commercial ships that use Breydon Water is now very few, although in the past it was part of an arterial route to the port of Norwich. Today, apart from pleasure hire-craft, the only commercial vessels that navigate the River Yare, are vessels up to 60 metres in length that occasionally make the journey to and from the sugar beet factory at Cantley. It is the Port Authority's responsibility to ensure that the main navigation channel is suitable for the vessels using it, i.e. a depth of over three metres in the ship channel and a minimum depth at the edge of the marked channel of no less than one metre of water at low tide. They also have a licence to dredge 500 cubic metres of spoil per annum from the vicinity of Breydon Water; although only 200 cubic metres per annum is removed from within the boundary of the European marine site. Maintenance dredging is also required every 10 to 20 years at several locations near the head of Breydon Water. This ensures that the river channel remains navigable just downstream from the confluence of the River Waveney and River Yare (within the boundary of the European marine site) and also at the entrance to Burgh Castle Marina (just upstream from the boundary of the European marine site on the River Waveney).

- The sub-features might also be vulnerable to any development that resulted in a change in the fluvial flow into the estuary. Modelling of the hydrological regime within the river system undertaken by the Broads Flood Alleviation Project will cast light on the hydrological requirements of the Broads cSAC, the Broadland SPA and Breydon Water SPA. Any flood defence schemes which are carried out on the rivers Bure, Yare or Waveney, which are in close proximity to the European marine site, should be undertaken at a time of year that causes the least disturbance to the assemblages of birds that use the site and the adjacent grazing marshes on both the SPA and adjacent farmland.

- Prior to the construction of the tidal groyne known as the "Dickey Works", the western part of Breydon Water varied between two and six feet depth at low water, with no exposure of the intertidal mudflats. It is likely that over the years the western mudflats have developed and are now dependent upon the presence of the "Dickey Works". The future management of this groyne may therefore have far reaching consequences for the continued maintenance of a stable river channel. Instability of the river channel would be undesirable as it might lead to a loss of intertidal sediment communities on parts of the estuary. It may also lead to a greater demand for maintenance dredging so as to ensure the long term navigability of the main channel.

- It should be highlighted that the sub-features might also be vulnerable to any development that resulted in a change in the tidal flow regime between the estuary and the open sea. Modelling would be necessary to demonstrate the impact of storm surge barriers or development of the harbour on the tidal regime of Breydon Water. To highlight the importance of this point, it is of interest to note that the tidal regime in the estuary has changed significantly since the 19th century, when Breydon Water was mainly reed-fringed along both banks. Since that time, the channel between the estuary and the open sea has changed such that there is a greater flow of salt water onto the intertidal sediments and today, the only remaining reed-beds are at Burgh Castle and Berney (Allard, P.A., 1990)

- It should also be noted that when northerly winds blow down the North Sea, it may result in an abnormally high low water at Breydon Water. During these periods only limited areas of mudflat are exposed. A series of weather systems resulting in a succession of abnormally high tides might well have serious effects on populations of wintering waders.

- The long term implications of sea-level rise should also be considered in relation to the potential for habitat loss. Breydon Water is constrained within sea defences and is all that remains of what was once a more extensive estuary system. In the lea of the sea walls, the saltmarsh has been modified to grazing

marsh, which itself is of considerable interest in terms of the populations of birds that it supports. However, as sea level rises occur, if there is not an opportunity to expand onto adjacent ground, the period and extent for which the mudflats will be exposed at low tide may gradually decrease. An increase in water depth within the estuary would also lead to an increase in wave energy. These effects could result in a gradual long-term decrease in feeding opportunity and food availability for the populations of birds that currently use Breydon Water. The Broads Flood Alleviation Project provides an opportunity to set back flood banks, thereby providing the estuary a capacity to accommodate sea level rise.

- Although exposure to activities resulting in the physical loss of sub-features at Breydon Water is low, the high sensitivity of the interest features leads to a moderate vulnerability. Those habitats that are considered vulnerable are shallow coastal water including the river channel, intertidal sediment communities and saltmarsh.

II) Physical Damage

- The habitats of Breydon Water both within the SPA and adjacent to it contribute to the "health" of the internationally important wildfowl populations including all qualifying species and their associated food supplies. Therefore, any operations or activities that would adversely affect these habitats may be detrimental to the species.

- Siltation as a result of agricultural run-off can cause localised increases in the levels of suspended sediments in estuary systems. Breydon Water is surrounded by sea walls and run-off enters the site indirectly. Suspended sediments are transported to the site by way of the Rivers Yare and Waveney (which themselves are banked for most of the distance to Norwich) and the River Bure, which only discharges into Breydon Water on a flood tide. Suspended sediments also enter the site by way of water discharged by various pumps around the periphery of the site. These include the Breydon Pump, the Berney Pump and Burgh Castle Marshes Pump which are operated by the Internal Drainage Boards, and also the Cobholm Riverside Park operated by Norfolk County Council. There is no evidence to suggest that the current sediment load carried by agricultural run-off is having a detrimental effect on bird numbers at the present time, but this is an issue which will need further investigation.

- Siltation can also occur as a result of dredging operations, the plumes from which may settle over large areas. The role of dredging in the complex process of sediment flux within estuaries can be significant in that continued disturbance of the channel geometry may result in changes to natural processes of sediment exchange. However, as highlighted in I), only limited maintenance dredging is carried out in the vicinity of Breydon Water and the interest features are only locally considered to be vulnerable to siltation. Over the site as a whole, they are considered to have a low vulnerability. The main dredging activity at Bowling Green Warf between Breydon Bridge and Haven Bridge (outwith the boundary of the SPA) is instigated as the tide is flowing out to sea, minimising the effect on Breydon Water itself. Dredging is also carried out to maintain shipping channels to the port of Great Yarmouth at the confluence of the River Yare and River Bure, at the mouth of the estuary, and also in offshore coastal waters. It has occasionally been observed that on a flood tide, plumes of sediments have been carried into the estuary, although there is currently no evidence to suggest that this is having a detrimental effect on the mudflat or saltmarsh communities. Should major engineering projects be proposed that might result in plumes of sediment entering Breydon Water (either from works in the estuary or the open sea), then there would need to be an assessment of the impact of sedimentation on the sub-features.

- The prey items on the intertidal mudflats live on the surface of the mud or within the sediment. Siltation is unlikely to affect availability of prey species as burrowing worms and shellfish would tend to migrate upwards through deposited silts. However, filter-feeding shellfish may be stressed by increased siltation and this may affect prey availability to waterfowl.

- It is recognised however, that there are natural processes which result in the reworking and redistribution of silts in Breydon Water. Environmental conditions can result in significant movements of silt within the estuary, resulting in the deposition of reworked silt over a wide area. During his work on eelgrass beds at Breydon Water, Ranwell et al (1974) confirmed that the level of the mudflats can undergo rapid fluctuations; for example, in places the surface accreted by up to 3 cm during a single gale. Further investigation is necessary to establish the effect that these events have on the use of the mudflats by wildfowl and waders.

- There are also issues in relation to the long term effects of siltation in Breydon Water. The long term trends in relation to sedimentation may give cause for concern if seral changes continue and saltmarshes increase in extent at the expense of mudflats (as described under I). The processes whereby sediment loads carried by the various rivers influence the development of saltmarsh at Breydon Water is in need of further investigation and a sediment budget for the Broads and its rivers would help to inform this process.

- Abrasion is another process which can cause physical damage to intertidal habitats, leading to an increased rate of loss of saltmarsh and intertidal mudflat. Abrasion within Breydon water is caused by the wash from the large numbers of boats that navigate the river channel, as well as from anchoring and trampling on the intertidal sediment communities directly. The Annex I birds of Breydon Water European marine site have a low sensitivity to abrasion on Intertidal sediment communities. This is because the invertebrates that the sediment communities support, and on which some of the Annex I birds feed, can recolonise from surrounding areas should abrasion have removed them completely. However, the migratory birds within the waterfowl assemblage, notably wigeon and European white-fronted geese have a high sensitivity to abrasion on Intertidal sediment communities as they feed on *Enteromorpha* which can be removed by abrasion. As discussed above, eelgrass beds were once extensive at Breydon Water, but are now thought to be extinct. A decline was triggered by eelgrass wasting disease, but other factors may have been involved in the final stages of the decline. Abrasion is known to destroy eelgrass beds and further investigation may be necessary with regard to this issue.

- Selective extraction, for instance the dredging of marine deposits to be used as aggregates, is not an issue at Breydon Water at the present time.

- Although the current levels of exposure to physical damage of the intertidal sediment communities is considered to be low, the *Enteromorpha* beds are highly sensitive to abrasion, therefore they receive a moderate vulnerability score.

III) Non-physical Disturbance

- Persistent noise and visual disturbance and particularly that associated with the presence of people, severely reduce roosting, feeding and nesting opportunities within the areas affected. Overwintering waterfowl are disturbed by sudden movements of objects and increases in noise disturbance over or adjacent to feeding and roosting areas. This may displace the birds to less favoured sites thus reducing their feeding efficiency whilst increasing their energy requirements. This factor is a particular concern during prolonged periods of cold weather. Waders find sufficient food difficult to obtain in mid to late winter as food resources and energy reserves are at their lowest and foraging for food can be difficult. When displaced, birds may move to feeding areas which are already occupied. This increases competition for food and space and thus adversely affects survival through the ability to feed and build the energy reserves required to survive during harsh weather. This may also impact on the successful migration to breeding grounds the following spring.

- Breydon Water is a Local Nature Reserve and is located very close to the urban and industrial hinterland

of Great Yarmouth and an interpretation board has been erected at the Breydon Bridge which gives an account of the interest of the site. At Cobholm, Herbert Barnes Park lies immediately adjacent to the estuary. The RSPB have established the Berney Marshes reserve, which is an attraction for bird watchers in the area. The estuary is almost entirely surrounded by sea walls, most of which have footpaths along the top which are used by walkers and bird watchers. A number of hides have been established specifically for the observation of wintering bird assemblages, several within easy walking distance from Great Yarmouth. Generally however, the birds are habituated to the current level of these recreational activities on the periphery of the site.

- Any activities which take people out onto the saltmarsh and mudflats have the potential to cause high levels of disturbance. One of the activities that falls into this category is wildfowling. There is a long history of wildfowling at Breydon Water and at one time wildfowlers used punt-guns and made their living through supplying the markets of Great Yarmouth. However, the intensity of wildfowling today is a fraction of the levels that were to be found one hundred and fifty years ago. In addition, the methods of wildfowling have altered over the years and today, this activity is predominantly land-based. At the present time, Great Yarmouth Borough Council, leases the eastern end of the estuary to the Great Yarmouth and District Wildfowling and Conservation Association. However, this area includes the most important high tide roosts for wintering bird assemblages. At the present time, negotiations are taking place to modify the areas over which wildfowling is practised in the vicinity of these roosts, while opening up alternative wildfowling areas on mudflats elsewhere in the estuary. An agreement of this nature should further reduce the impact of wildfowling at Breydon Water.

- Another activity which takes people onto the mudflats is crab fishing (the crabs provide bait for recreational sea fishing). This activity has occurred on an informal and unregulated basis for some years, particularly along the edge of the seawall. More recently there has been a change in methods and an increase in intensity and this activity is now carried out on a semi-commercial basis on the mudflats themselves. Sections of guttering have been driven into areas and these are checked at low tide. Further investigation is needed to assess the intensity of crab fishing and its impacts on the populations of birds that make use of Breydon Water. Common tern may be particularly vulnerable if crab fishing is carried out in the vicinity of the nesting platforms.

- Bait digging is also an activity which takes people out onto the mudflats. It is no longer an issue on the estuary as local by-laws have been passed, preventing this activity.

- The area between the red and green navigation posts regularly surveyed and maintained by the Great Yarmouth Port Authority is deemed to be the main Navigation Channel (as defined by the Great Yarmouth Port Authority). Slow moving pleasure craft, yachts and commercial vessels are confined to this channel and this usage of the estuary does not result in high levels of disturbance. The use of pleasure craft and yachts in the Broads is very popular and reaches its peak during the summer months. Breydon Water can be very busy during the tourist season as it is the sole waterway connecting the basins of the rivers Bure, Yare and Waveney. It is also the only practical waterway for access between the North Sea and the River Yare and Suffolk rivers. The use of pleasure boats, yachts or commercial vessels within the main navigation channel on Breydon Water is not perceived as an issue in relation to the wintering wildfowl and wader assemblages or the breeding population of common tern.

- The exposure to craft that are either fast or noisy or which are not confined to the river channel contributes to the high vulnerability of the birds to non-physical disturbance. Activities which fall into this category include power boating, jet skis, water skiers, and wind surfing. However, canoeing does not seem to have been popular at Breydon Water and the depth of water is not sufficient for sailing outwith the river channel. Further investigation is needed to assess the impact of these activities on the birds at the site. However, it is recognised that these activities reach their peak during the summer months and are therefore unlikely to be an issue in relation to the wintering wildfowl and wader

assemblages. However, at this time there may be some impact on the population of common tern, either in terms of disturbance while feeding or disturbance at breeding sites.

- Low-flying aircraft, particularly helicopters and microlites, are known to be very disturbing to waterfowl. It is understood that the level of helicopter activity over Breydon Water has been reduced since helicopter activity at Beccles declined. However, although the flight lines of most commercial flights that take off from the Great Yarmouth heliport take most helicopters out towards the North Sea, test flights often take helicopters over the line of the A47 trunk road and the railway on the north side of Breydon Water. These activities inevitably cause disturbance to the birds. The unregulated use of microlites also has the potential to cause high levels of disturbance.

- Military aircraft from RAF and USAF bases in Norfolk avoid flying in the vicinity of Great Yarmouth as it is situated at the beginning of the southern north sea helicopter corridor. Military fixed wing aircraft are only permitted to fly over Great Yarmouth at an altitude of 2,000 feet and military helicopters at 1,000 feet. Although Great Yarmouth lies at the eastern end of Breydon Water, it should be noted that military aircraft do have the potential to cause disturbance on the Breydon Water European marine site.

- The A47 trunk road forms one of the arterial routes to Great Yarmouth and runs adjacent to Breydon Water. The busy Breydon Bridge actually forms part of the boundary to the European marine site. In addition, the railway and railway sidings lie immediately adjacent to the sea wall near the main roosting areas in the north east of the estuary. Generally however, the birds are habituated to the current background levels of noise and visual disturbance that result from road and rail transportation on the periphery of the site.

- The birds at Breydon Water are currently considered to be highly vulnerable to the combined impacts of non-physical disturbance. It is apparent that some of the activities cause only minimal impact while others have the potential to cause significant levels of disturbance. While the impacts of some of these activities are well known, the disturbance resulting from activities like crab fishing need further assessment. Further investigations are needed to assess the cumulative effects of the wide array of activities on different parts of the estuary and also the cumulative effects of the level of disturbance from several simultaneous sources of disturbance. Where appropriate, it may be necessary to investigate the practicality of introducing measures to reduce the levels of non-physical disturbance to the site.

IV) Toxic contamination

- Waterfowl are subject to the accumulation of toxins through the food chain or through direct contact with toxic substances when feeding. Their ability to feed can also be affected by changes in the palatability of prey items caused by toxic contamination. Bird populations may also be affected indirectly by contaminants affecting the abundance of their food items. Toxic contaminants in the marine environment are, however, often the result of diffuse sources and so the precise source can be difficult to identify.

- It is recognised that diffuse agricultural pollution occurs throughout the catchments of the estuary so there is a possibility of pesticides entering the European marine site via in-flowing rivers and tributaries. Surplus water is also discharged into the estuary from the surrounding agricultural land by the pumps operated by the Internal Drainage Boards and the Borough Council. During the period 1992-94, the Environment Agency collected data from point sources on the Rivers Bure, Yare and Waveney, which demonstrated that the level of toxic contamination from agricultural runoff was not an issue at Breydon Water at that time.

- At one time, discharges from Sewage Treatment Works would also have contributed to the levels of

toxic contamination in Breydon Water as the effluent would have contained some non-synthetic compounds from the trade discharges they receive. In the past, much of the sewage of Great Yarmouth was discharged either into Breydon Water or the River Yare. However, today this effluent is pumped to Caistor Sewage Treatment Works and is ultimately discharged at sea. There may be low levels of drainage from Breydon Bridge, but potentially this would only be an issue if there were a serious road spill.

- The effluent of Norwich was also discharged into the River Yare via the Whittlingham Sewage Plant and during the 1970s, significant levels of mercury were released into the river resulting in high levels of contamination on those reaches between Norwich and Strumpshaw. Maintenance dredging of this river is very tightly controlled for fear of disturbing mercury, which at the present time is locked in river deposits. However, the possibility of mercury contamination at Breydon Water was investigated by the Environment Agency and was not thought to be an issue.

- Great Yarmouth has a long history as a port and industrial town and Great Yarmouth Borough Council is currently working on a Contaminated Land Register. It is possible that further investigations may highlight areas of contaminated land that might have local effects on the estuary.

- Many commercial vessels use the port of Great Yarmouth and it is possible that contaminants may be flushed into Breydon Water if released in the vicinity of the port facilities. Contamination might result from either cleaning of holds, contamination by antifoulants, or by pollution incidents. As a major port, Great Yarmouth has an oil spill contingency plan which involves installing a boom across the River Yare, in the vicinity of the Breydon Bridge.

- The distribution of radioactivity in seawater around the British Isles is a large factor in determining the variation in individual exposures at coastal sites. A programme of surveillance into the distribution of key radionuclides is maintained using research vessels and other means of sampling. This has concluded that the coastal waters of the British Isles including the North Sea are contaminated by radionuclides (Centre for Environment, Fisheries and Aquaculture Science, 1999). The 1998 data for the North Sea show similar levels to those observed from sampling in recent years, the general distribution being one of falling concentrations as the distance from Sellafield increases. Very low levels of radionuclides are therefore flushed into Breydon Water with tidal waters.

- Within Breydon Water, the shallow coastal waters and intertidal sediment community sub-features are currently considered to be moderately vulnerable to the introduction of synthetic compounds. The combined impact of the many activities described above, particularly the level of contamination originating from commercial vessels at Great Yarmouth needs further investigation. Although there is currently no evidence to suggest this is having a detrimental effect on bird numbers, it is an issue which will need to be addressed. Although the sensitivity of the sub-features to the introduction of non-synthetic compounds is the same as for synthetic compounds, the current level of exposure is low and therefore the interest features are not considered to be vulnerable at the present time.

V) Non-toxic contamination

- Nutrient enrichment can reduce the availability of food for some wildfowl by increasing growth of algal mats on the intertidal area. The majority of bird species that use the European marine site feed on the intertidal invertebrates which would be adversely affected by increases in the extent of green macroalgal mats. However, wigeon can actually benefit from an increased rate of growth of these macroalgal mats as they form part of their diet.

  Nutrient enrichment can also lead to the occurrence of blooms of planktonic algae which can have a number of detrimental effects on marine systems. After an algal bloom, the quality of the surrounding water can be reduced as oxygen levels are depleted by the decomposing algae. Sometimes this

decomposition can also be accompanied by the release of toxins. Such a deterioration in water quality can impact on marine communities and cause a reduction in food availability. Blooms of planktonic algae can also cause a reduction in water clarity, thereby reducing the visibility of prey items to common terns and avocets in particular.

The Environment Agency are currently submitting a report in accordance with the Urban Waste Water Treatment Directive to suggest that the Yare upstream of Cantley is designated as a sensitive area (eutrophic). Stretches of the Wensum, Ant and the Bure are already designated as such, implying that phosphorus concentrations in the system are considered likely to produce eutrophic conditions. As a result, phosphorus stripping has been implemented at 'qualifying treatment works'. The Environment Agency has found that despite the eutrophic conditions of many of the rivers in its catchment, Breydon Water does not exhibit indications of eutrophication. It has been suggested that because this is a very turbid estuary, primary production is limited and hence, the effects of eutrophic conditions have not manifested themselves on the site. It should be highlighted however, that although eutrophication is not thought to be an issue at the present time, it may become an issue if there was a significant increase in the extent of green macroalgal mats. These may develop at the expense of the intertidal sediment invertebrate communities which are an important food source for the waders that use the site. It should be noted however, that within the catchment of Breydon Water, there are a suite of European sites including the River Wensum cSAC, the Broads SAC and the Broadland SPA. These sites have a much greater sensitivity to eutrophication and as a consequence of addressing these issues, it is likely that there will be a long term reduction in the nutrient loading entering Breydon Water.

- It is generally understood that an increase in organic loading tends to increase the biomass of invertebrates within an estuarine system. Organically enriched sediments benefit invertebrate prey species that can tolerate low oxygen levels. Often, this increased biomass consists of relatively few invertebrate species. Although there may be an abundance of marine worms (oligochaetes) which thrive in these conditions, there are usually few other species present. This may increase the overall number of birds exploiting the food resource, but reduce the diversity of bird species. Whilst it may appear that birds benefit under these circumstances because large numbers visit such areas to feed, it is likely to indicate opportunism by a limited number of bird species, and is unlikely to benefit the estuary bird populations as a whole. Reducing organic loading by improving discharge quality into the site may yield a lower mass of invertebrate prey, and in turn lead to a reduction in the number of birds. However, cleaner water is likely to promote a greater diversity of invertebrate species which could in turn be exploited by a greater diversity of bird species. Consequently, there is an apparent 'trade-off' between high biomass and bird numbers and a more diverse and stable ecosystem. In the absence of such organically enriched areas, birds are likely to be more widespread on the intertidal flats.

- As indicated above, effluent from Great Yarmouth is now pumped to the Caistor sewage treatment works and no longer enters Breydon Water. However, treated effluent reaches Breydon Water from discharges into the river systems that flow into Breydon Water, and also via the Breydon Pump from the sewage treatment works at Halvergate. Organic input may also result from outfalls into the River Yare from the sugar beet factory at Cantley. It is an offence for pleasure vessels or commercial vessels to discharge raw sewage into Breydon Water and the river systems upstream, and effluent has to be pumped ashore.

- The recently completed gas fired power station at Great Yarmouth will utilise river water for the cooling system. However, the outflow pipe empties into the open sea and hence there is no effect on the thermal regime in the River Yare or Breydon Water on a flood tide.

- Increases in turbidity levels may be caused by an increase in suspended sediments brought about by activities such as dredging and disposal. Under certain conditions this may have an adverse effect on benthic communities thus reducing the birds' food availability. In addition, increased turbidity levels

will reduce visibility which may reduce the efficiency of active foraging, particularly by the Annex I species, common tern. As mentioned previously, algal blooms can also cause a similar reduction in water clarity. Most prey communities are adapted to turbid conditions and increases from man-induced sources are likely to be tolerated. Although recognised as a turbid estuary, the interest features are not considered to be vulnerable to changes in turbidity at the present time.

- Studies carried out on some estuaries in Suffolk and Essex have indicated that freshwater flows over intertidal habitats may be important for waders and wildfowl. (Ravencroft 1998) The study found that the number and density of some waterfowl in corridors around freshwater flows were consistently greater than on other areas of mudflat. Freshwater flows into Breydon Water are via the Rivers Bure, Waveney and Yare, with lesser flows via pumped outfalls. The Breydon, Berney, Burgh Castle and Cobholm pumping stations are more active during the winter months hence there is an alternation in salinity regime at low tide with increased freshwater flows across mudflats adjacent to pumps during the winter, but reduced flows during the summer months. These changes in salinity may well have an impact on invertebrate communities on local areas of the mudflats.

- At the present time, only the intertidal sediment communities are moderately vulnerable to changes in nutrient loading. Otherwise, the interest features of Breydon Water are not considered to be vulnerable to the impacts associated with changes in nutrient loading, organic loading, thermal regime, turbidity or salinity. However, as the rivers feeding into Breydon Water have reaches which have been identified as eutrophic, the exposure scores may well change in the future thus increasing the vulnerability.

VI) Biological disturbance

- Microbial pathogens may enter the estuary through sewage discharges or by introduction of organisms brought in by shipping. As pathogens are species specific, specialist feeders which feed on shellfish, could be affected if an epidemic disease severely depleted a particular food source. However, there are no longer any sewage outfalls that discharge into Breydon Water and the introduction of microbial pathogens are not thought to be an issue.

- During the warm summer of 1975, the increased water temperatures and high nutrient levels in the broads resulted in an outbreak of avian botulism (*Clostridium botulinum*). The outbreak was thought to have caused the deaths of several thousand birds, and dying birds were seen at Breydon Water.

- On the British coast, eelgrass is important in the diet of herbivorous wildfowl such as European white fronted geese and wigeon. However, during the 1930's, the eelgrass beds of Breydon Water were affected by eelgrass wasting disease, which significantly reduced the availability of this food plant to wildfowl. Despite attempts in the 1970's to transplant eelgrass and create new beds, the decline continued. Survey work is needed to establish the current status of eelgrass at Breydon Water and further work would also be desirable to understand the causes of the continued decline of eelgrass and ascertain the feasibility of further reintroductions.

- An introduced species may affect the availability of prey items to birds either through predation of favoured prey or by out competing them for food, therefore mudflats and saltmarsh have a moderate sensitivity to the introduction of non-native species.

- Common cord-grass *Spartina anglica* was first recorded at Breydon Water in 1961 and began to spread rapidly by colonising bare mudflats. The spread of this hybrid can alter the profile of estuaries by increasing the depth of stabilised sediment and making them drier. This makes these habitats less suitable for a range of intertidal invertebrates and the waterfowl that feed on them. Control measures were initiated in 1971 and have been very successful. *Spartina* is currently being successfully controlled by wildfowlers within the European marine site. Originally control was by the use of Round-

Up, although hand-pulling is the only method practised today.

- Other exotic species may be recorded from the site but do not have the same ecological impact as common cord-grass. For instance, it has been suggested that the Asiatic clam could colonise the river channel.

- Over exploitation of the fisheries which support breeding common tern as well as species of the internationally important waterfowl population, within the European marine site and adjacent waters, could adversely affect the favourable condition of the site. There are no commercial fisheries in Breydon Water and none of the Great Yarmouth fishing boats use this body of water. However, there are low levels of recreational angling and Fyke-netting for eels on the site, but these activities are not considered to be an issue at the present time. Bait digging is no longer an issue on the estuary as there are now by-laws preventing this activity.

- In terms of bird kills, the current levels of wildfowling are thought to be sustainable at Breydon Water. However, the main effects of this activity on the birds are in relation to non-physical disturbance as described in 6.8.1 III

- Within Breydon Water, the interest features are not currently considered to be vulnerable to biological disturbance resulting from the introduction of microbial pathogens, the introduction of non-native species or the selective extraction of species.

Table 4. Assessment of the relative exposure of interest features and sub-features of Breydon Water European marine site to different categories of operations based on current level of activities (May 2001)

Key: High= High exposure Med =Medium exposure Low= Low exposure None= No exposure

Categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species		Internationally important waterfowl assemblage		
	Shallow coastal waters inc. river channel	Intertidal sediment communities (inverts. only)	Saltmarsh	Artificial nesting platforms	Intertidal sediment communities (inverts. only)	Saltmarsh	Shallow coastal waters inc. river channel	Intertidal sediment communities (*Zostera / Enteromorpha* beds and inverts.)	Saltmarsh
Physical loss									
Removal (e.g. land claim, maintenance dredging of channel)	Low	Low	Low	None	Low	Low	Low	Low	Low
Smothering (e.g. by artificial structures, disposal of dredge spoil)	None	Low	Low	None	Low	Low	None	Low	Low
Physical damage									
Siltation (e.g. agricultural run-off, dredging)	Low	Low	Low	None	Low	Low	Low	Low	Low
Abrasion (e.g. wash from boats)	Low	Low	Low	None	Low	Low	Low	Low	Low
Selective extraction (e.g. aggregate dredging).	None	None	None	None	None	None	None	None	None
Non-physical disturbance									
Noise (e.g. aircraft noise)	High	High	High	High	High	High	High	High	High
Visual (e.g. recreational activity)	High	High	High	High	High	High	High	High	High

Categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species		Internationally important waterfowl assemblage		
	Shallow coastal waters inc. river channel	Intertidal sediment communities (inverts. only)	Saltmarsh	Artificial nesting platforms	Intertidal sediment communities (inverts. only)	Saltmarsh	Shallow coastal waters inc. river channel	Intertidal sediment communities (*Zostera / Enteromorpha* beds and inverts.)	Saltmarsh
Toxic contamination									
Introduction of synthetic compounds (e.g. Pesticides, TBT, PCBs.	Med	Med	Low	None	Med	Low	Med	Med	Low
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	Low	Low	None	None	Low	None	Low	Low	None
Introduction of radionuclides (e.g. contamination derived from Sellafield)	Low	Low	Low	Low	Low	Low	Low	Low	Low
Non-toxic contamination									
Changes in nutrient loading (e.g. agricultural run-off)	Med	Med	Low	None	Med	Low	Med	Med	Low
Changes in organic loading (e.g. sewage outfalls)	Low	Low	Low	None	Low	Low	Low	Low	Low
Changes in thermal regime (e.g. power stations)	None	None	None	None	None	None	None	None	None
Changes in turbidity (e.g. agricultural run-off)	Low	Low	None	None	Low	None	Low	Low	None
Changes in salinity (e.g. outfalls)	Low	Low	None	None	Low	None	Low	Low	None

Categories of operation which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species		Internationally important waterfowl assemblage		
	Shallow coastal waters inc. river channel	Intertidal sediment communities (inverts. only)	Saltmarsh	Artificial nesting platforms	Intertidal sediment communities (inverts. only)	Saltmarsh	Shallow coastal waters inc. river channel	Intertidal sediment communities (*Zostera / Enteromorpha* beds and inverts.)	Saltmarsh
Biological disturbance									
Introduction of microbial pathogens (e.g. eelgrass wasting disease)	Low	Low	Low	Low	Low	Low	Low	Low	Low
Introduction of non-native species & translocation (e.g. common cordgrass)	Low	Low	Low	None	Low	Low	Low	Low	Low
Selective extraction of species (e.g. commercial & recreational fishing)	Low	Low	Low	None	Low	Low	Low	Low	Low

Table 5. Assessment of the relative vulnerability of interest features and sub-features of Breydon Water European marine site to different categories of operations.
Categories of operations to which the features or sub-features of the site are highly or moderately vulnerable are indicated by shading. Table also incorporates relative sensitivity scores used in part to derive vulnerability.[9]

Key

	High vulnerability	••••	High sensitivity
	Moderate vulnerability	•••	Moderate sensitivity
		••	Low sensitivity
		•	No detectable sensitivity

Categories of operations which may cause deterioration or disturbance	**Internationally important populations of regularly occurring Annex I species**				**Internationally important migratory species**		**Internationally important waterfowl assemblage**		
	Shallow coastal waters inc. river channel	Intertidal sediment communities (inverts. only)	Saltmarsh	Artificial nesting platforms	Intertidal sediment communities (inverts. only)	Saltmarsh	Shallow coastal waters inc. river channel	Intertidal sediment communities *Zostera / Enteromorpha* beds and inverts.)	Saltmarsh
Physical Loss									
Removal (e.g. land claim, maintenance dredging of channel)	••••	••••	••••	•	••••	••••	••••	••••	••••
Smothering (e.g artificial structures, disposal of dredge spoil)	••	•••	•••	•	•••	•••	••	•••	•••
Physical Damage									
Siltation (e.g. agricultural run-off, dredging)	••	••	••	•	••	••	••	••	••
Abrasion (e.g. wash from boats)	••	••	•••	•	••	•••	••	••••	•••
Selective extraction (e.g. aggregate dredging)	••	•••	••	•	•••	••	••	••••	••

Categories of operations which may cause deterioration or disturbance	Internationally important populations of regularly occurring Annex I species				Internationally important migratory species		Internationally important waterfowl assemblage		
	Shallow coastal waters inc. river channel	Intertidal sediment communities (inverts. only)	Saltmarsh	Artificial nesting platforms	Intertidal sediment communities (inverts. only)	Saltmarsh	Shallow coastal waters inc. river channel	Intertidal sediment communities *Zostera / Enteromorpha* beds and inverts.)	Saltmarsh
Non-physical disturbance									
Noise (e.g. aircraft noise)	••••	••••	••••	••••	••••	••••	••••	••••	••••
Visual presence (e.g. recreational activity)	••••	••••	••••	••••	••••	••••	••••	••••	••••
Toxic contamination									
Introduction of synthetic compounds (e.g. pesticides, TBT, PCBs)	•••	•••	•••	•	•••	•••	•••	•••	•••
Introduction of non-synthetic compounds (e.g. heavy metals, hydrocarbons)	•••	•••	•••	•	•••	•••	•••	•••	•••
Introduction of radionuclides (e.g. contamination from Sellafield)	•	••	••	•	••	••	•	••	••
Non-toxic contamination									
Changes in nutrient loading (e.g. agricultural run-off)	••	•••	••	•	•••	••	••	•••	••
Changes in organic loading (e.g. sewage outfalls)	••	•••	••	•	•••	••	••	•••	••
Changes in thermal regime (eg. power stations)	••	••	•	•	••	•	••	••	•
Changes in turbidity (eg. agricultural run-off)	•••	••	•	•	••	•	•••	••	•
Changes in salinity (e.g. outfalls)	•••	••	••	•	••	••	•••	•••	••

Categories of operations which may cause deterioration or disturbance	**Internationally important populations of regularly occurring Annex I species**				**Internationally important migratory species**		**Internationally important waterfowl assemblage**		
	Shallow coastal waters inc. river channel	Intertidal sediment communities (inverts. only)	Saltmarsh	Artificial nesting platforms	Intertidal sediment communities (inverts. only)	Saltmarsh	Shallow coastal waters inc. river channel	Intertidal sediment communities *Zostera / Enteromorpha* beds and inverts.)	Saltmarsh
Biological disturbance									
Introduction of microbial pathogens (e.g. eelgrass wasting disease).	••	••	•	•	••	•	••	••	•
Introduction of non-native species & translocation (e.g. common cordgrass)	••	•••	•••	•	•••	•••	••	•••	•••
Selective extraction of species (e.g. commercial and recreational fishing)	•••	•••	•••	•	•••	•••	•••	•••	•••

[9] English Nature's advice on operations is derived from an assessment combining relative sensitivity of the features or sub-features with information on human usage of the site (as at May 2001), to identify relative vulnerability to categories of operations. In accordance with Government policy guidance this advice is provided in the light of current activities and patterns of usage at the site. It is important therefore that future consideration of this advice by relevant authorities, and others, takes account of changes in the usage patterns at the site. In contract the sensitivity of interest features, or sub-features, is relatively stable with alterations reflecting improvement in our scientific knowledge and understanding. To this end, information on sensitivity has been included in this table to assist the management and advisory groups with the future management of the site.

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8. Glossary

Advisory Group	The body of the representatives from local interests, user groups and conservation groups, formed to advise the management group
Annex I Bird species	The species listed in Annex I of the Birds Directive are the subject of special conservation measures concerning their habitat. These measures ensure the survival and reproduction of the birds in their area of distribution. Species listed on Annex I are in danger of extinction, rare or vulnerable
Annex I habitat type(s)	A natural habitat(s) listed in Annex I of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex II species	A species listed in Annex II of the Habitats Directive for which Special Areas of Conservation can be selected.
Annex V	The listing, in the Habitats Directive, of the animal and plant species whose taking in the wild and exploitation may be subject to management measures.
Assemblage	A collection of plants and/or animals characteristically associated with a particular environment.
Attribute	Characteristic of an interest feature/sub-feature which provides an indication of the condition of the feature or sub-feature to which it applies.
BAP	Biodiversity Action Plan.
Benthos	Those organisms attached to, or living on, in or near, the seabed, including that part which is exposed by tides.
Biotope	The physical habitat with its biological community; a term which refers to the combination of physical environment and its distinctive assemblage of conspicuous species.
Biodiversity	The total variety of life on earth. This includes diversity within species, between species and ecosystems.
Characteristic	Special to, or especially abundant in, a particular situation or biotope. Characteristic species should be immediately conspicuous and easily identified.
Circalittoral	The rocky subtidal zone below that which is dominated by algae (Animal dominated subtidal zone).
Community	A group or organisms occurring in a particular environment, presumably interacting with each other and with the environment, and identifiable by means of ecological survey from other groups.
Competent authority	Any Minister, government department, public or statutory undertaker, public body or person holding a public office that exercises legislative powers.
Conservation objective	A statement of the nature conservation aspirations for a site, expressed in terms of the favourable condition that we wish to see the species and/or habitats for which the site has been selected to attain. Conservation objectives for European marine sites relate to the aims of the Habitats Directive.
Eulittoral	The main part of the intertidal zone characterised by limpets, barnacles, mussels, fucoid algae and with red algae often abundant on the lower part.
Epifauna	Benthic animals living on the seabed.
European marine site	A European site which consists of, or in so far as it consists of, areas covered intermittently or continuously by seawater.

European Site	A classified SPA, designated SAC, site of Community importance (a site selected as a candidate SAC, adopted by the European Commission but not yet designated), a candidate SAC (in England only) or a site hosting a priority species in respect of which Article 5 of the Habitats directive applies.
Favourable conservation status	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function throughout the EC in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.
Favourable condition	A range of conditions for a natural habitat or species at which the sum of the influences acting upon that habitat or species are not adversely affecting its distribution, abundance, structure or function within an individual Natura 2000 site in the long term. The condition in which the habitat or species is capable of sustaining itself on a long-term basis.
Habitat	The place in which a plant or animal lives.
Habitats Directive	The abbreviated term of *Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora*. It is the aim of this Directive to promote the conservation of certain habitats and species within the European Union.
Infauna	Benthic animals which live within the sediment.
Infralittoral	The subtidal zone in which upward facing rocks are dominated by erect algae, typically kelps.
Interest feature	A natural or semi-natural feature for which a European site has been selected. This includes any Habitats Directive Annex I habitat or any Annex II species and any population of a bird species for which an SPA has been designated under the Birds Directive.
Maintain	The action required for an interest feature when it is considered to be in favourable condition.
Management group	The body of relevant authorities formed to manage the European marine site.
Management scheme	The framework established by the relevant authorities at a European marine site under which their functions are exercised to secure, in relation to that site, compliance with the requirements of the Habitats Directive.
Nationally scarce/rare	For marine purposes, these are regarded as species of limited national occurrence.
Natura 2000	The European network of protected sites established under the Birds Directive and the Habitats Directive.
Notable species	A species that is considered to be notable due to its importance as an indicator, and may also be of nature conservation importance, and which is unlikely to be a 'characteristic species.'
Operations which may cause deterioration or disturbance	Any activity or operation taking place within, adjacent to, or remote from a European marine site that has the potential to cause deterioration to the natural habitats for which the site was designated, or disturbance to the species and its habitats for which the site was designated.
Plan or project	Any proposed development that is within a relevant authority's function to control, or over which a competent authority has a statutory function to decide on applications for consents, authorisations, licences or permissions.

Peak mean counts (5 yr)	Breydon Water is broken down into count sectors. Over the winter months WeBs volunteers count all the birds which are visible within each sector. The yearly figures for each species in Breydon Water are then averaged over a five year period to give the 5 yr peak mean count.
Relevant authority	The specific competent authority which has powers or functions which have, or could have, an impact on the marine environment, or adjacent to, a European marine site.
Restore	The action required for an interest feature when it is not considered to be in a favourable condition.
Sensitivity	The intolerance of a habitat, community or individual species to damage from an external force.
Sub-feature	An ecologically important sub-division of an interest feature.
Vulnerability	The exposure of a habitat, community or individual of a species to an external factor to which it is sensitive.
WeBs	Wetland Bird Survey: a collaborative national surveillance scheme of the UK's waterfowl based on counts undertaken once per month outside of the breeding season.

Appendix I Matrix of relative vulnerability

The relative vulnerability of an interest feature or sub-feature is determined by combining the relative sensitivity and exposure assessments according to the table below.

Relative exposure of the interest feature	Relative sensitivity of the interest feature: High (●●●●)	Moderate (●●●)	Low (●●)	None detectable (●)
High				
Medium				
Low				
None				

Categories of relative vulnerability

- High
- Moderate
- Low
- None detectable

Appendix II English Nature's 'Habitats regulations guidance note 1: The Appropriate Assessment (Regulation 48)'

Appendix III List of relevant authorities

English Nature
Great Yarmouth Borough Council
The Broads Authority
Broadland District Council
South Norfolk District Council
Norfolk County Council
English Heritage
Environment Agency
Anglian Water Services Ltd
Lower Bure and Halvergate Internal Drainage Board (C/O King's Lynn Consortium of Internal Drainage Boards)
Langley, Chedgrave and Tofts Monk Internal Drainage Board
Muckfleet and South Flegg Internal Drainage Board
Burgh Castle, Bradwell, Gorleston, Southtown and Cobholm Internal Drainage Board
Great Yarmouth Port Authority

Figure 1

Location Map of the Breydon Water Special Protection Area

Figure 2

Boundary map of the Breydon Water European marine site.

Figure 3

Map of the Breydon Water European marine site showing the distribution of sub-features